Sub D1 B

≤ 2; E, G and J are different from each other, and are each selected from the group consisting of Cu, Ag, Au, Zn, Al, W, Li and Mg; M is Ca, Sr, Na, K, Rb, O, F, Cl, Br or I; $0.001 < e < 0.999$; $0.001 < g < 0.999$; $0 \leq m \leq 2$; and $0 < z < 2\ (1+m)$, as an active material of a negative electrode, in an amount of 75% to 99.9% by weight of the composition of the negative electrode.

Sub D1 B

21. (Amended) A nonaqueous secondary battery, which comprises:

a negative electrode whose active material comprises a compound of formula (1):

$$A_aS \qquad (1)$$

wherein A is Cu, Ag or Au, and $0.4 \leq a \leq 5$, in an amount of 75% to 99.9% by weight of the composition of the negative electrode, and a nonaqueous electrolytic solution as an electrolyte.--

REMARKS

Claims 6-18 and 20 stand withdrawn from consideration. Claims 2-5, 19 and 21 are active in the case. Reconsideration is respectfully requested.

The present invention relates to a nonaqueous secondary battery.

The discovery of the present invention is a negative electrode for nonaqueous secondary batteries which exhibits improved characteristics. The negative electrode is formed of a sulfide compound of formula (1): A_aS, wherein A is copper, silver or gold and $0.4 \leq a \leq 5$, and further wherein the amount of metal sulfide in the negative electrode is at least 75% to 99.9% by weight of the composition of the negative electrode.

In the embodiment of the invention as set forth in Claim 19, the active material of the negative electrode is one of the three different sulfides having formulas (1), (2) or (3), wherein the metal elements of these formulas are as defined in the claim, and element M is also defined

in the claims.

Claims 2-5, 19 and 21 stand rejected based on 35 U.S.C. §103 as obvious over Kawakami et al, U.S. Patent 5,702,845. This ground of rejection is respectfully traversed.

The Kawakami et al reference describes secondary batteries which employ lithium. Negative electrodes for the battery are described in the disclosure at column 7, line 61 to column 8, line 12 while positive electrodes are described at column 8, lines 13 et seq. However, it must be noted that of the negative electrodes described in the reference, none of them are sulfides, and certainly not any of the sulfide materials of the present claims.

The Examiner asserts on page 5 of the Office Action that in view of the fact that a number of different types of materials are known to be useful as positive and negative electrodes in secondary batteries, one of skill in the art would find it obvious to use any given material either as a negative electrode or a positive electrode in a battery depending upon the circumstances of the construction of a specific battery. Thus the Examiner asserts that the sulfides disclosed in Kawakami et al as a positive electrode material would be appreciated by one of skill in the art as being useful in negative electrode construction, thereby leading directly to the present invention. However, Applicant does not concur with this conclusion.

In the first place, it must be noted that the present invention provides a secondary battery having the features described on page 1, lines 9-13, and in particular secondary batteries which exhibit a high voltage, high energy density and excellent charging and discharging characteristics, as well as long cycle life and high reliability. Many kinds of positive electrode active materials, as well as negative electrode active materials, have been proposed in the secondary battery field. Kawakami et al simply disclose some of the active materials which are useful for positive electrodes and some which are useful for negative electrodes. However,

Applicant maintains that one of skill in the art reviewing the Kawakami et al reference would not be led to the use of the specific negative electrode active materials of the present invention in the construction of a secondary battery. The discovery of the present invention is the specific advantageous effects achieved by the use of the sulfide materials of the present claims. There is nothing in Kawakami et al which would lead the skilled artisan to expect the selection of the specific sulfides of the present invention would give the results Applicant has obtained.

Applicant's position can be appreciated, for example, by considering the working example of Example 1 of the reference. Here it is stated in column 12, lines 22-24 that the cutoff voltages employed during charging and discharging of the battery were set at 4.5 volts and 2.5 volts respectively. However, it must be noted that when the active material subjected to such high voltages is employed as the active material of a negative electrode under low electric potential, irreversible destruction of the structure of the active material may occur. Accordingly, the present invention clearly cannot be reduced just to a pick and choose situation in which one of skill in the art would simply recognize that he could use a sulfide material, disclosed as a positive electrode material, in fact as a negative electrode material in the construction of any secondary battery the skilled artisan would try to construct and expect to achieve the results of the present invention. Given the facts as set forth above with respect to Example 1 of Kawakami et al, it is believed clear that the skilled artisan would not be led to the present invention by Kawakami et al and withdrawal of the ground of rejection over Kawakami et al is respectfully requested.

Claim 5 stands rejected based on 35 U.S.C. §103 as obvious over Kawakami et al in view of Kondo et al or Plichta et al. This ground of rejection is respectfully traversed.

Given that Claim 5 simply specifies certain specific sulfide compounds which are useful in negative battery construction in the present invention, and given that, in fact, none of the cited

prior art references would suggest the construction of the negative electrode of a nonaqueous secondary battery from sulfides having formula (1) of the present claims, it is clear therefore that one of skill in the art would not be led by the references to the specific sulphide compounds of Claim 5 in negative electrode construction. Besides this fact, Applicant notes that Kawakami et al use an electrolytic solution prepared by dissolving an electrolyte in a solvent, whereas Kondo et al and Plichta et al use solid electrolytes. Clearly, one of skill in the art would not be motivated to combine the references as the Examiner has done since the battery of Kawakami et al is of fundamentally different type than the solid electrolyte-based batteries of Kondo et al and Plichta et al. Accordingly, Claim 7 is not obvious over the disclosures of the combined prior art, and therefore withdrawal of the rejection is respectfully requested.

Claims 2-5, 19 and 21 stand rejected based on 35 U.S.C. §112, first paragraph. This ground of rejection is obviated by the amendments to Claims 19 and 21 in which the upper limit for the active material of the negative electrode has been specified as 99.9% by weight. Support for this limitation can be found at page 10, lines 25-28 of the text. Since the amendment does not introduce new matter, and further limits the scope of Claims 19 and 21, entry of the same into the record is respectfully requested.

It is now believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Norman F. Oblon
Attorney of Record
Registration No.: 24,618

Frederick D. Vastine, Ph.D.
Registration No.: 27,013

22850

TEL: 703-413-3000
FAX: 703-413-2220

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MARKED-UP COPY OF AMENDMENT

IN THE CLAIMS

Please amend Claims 19 and 21 as follows:

--19. (Twice Amended) An energy storage device having a nonaqueous electrolytic solution and a compound of any one of the [formula] formulas (1) to (3):

A_aS (1)

$B_bD_{(1-b)}S_y$ (2)

$E_eG_gJ_{(1-e-g)}M_mS_z$

where A is Cu, Ag or Au; $0.4 \leq a \leq 5$; B and D are different from each other, and are each selected from the group consisting of Cu, Ag, Au, Zn, Al, W and Li; $0.001 \leq b \leq 0.999$; $0 < y < 2$; E, G and J are different from each other, and are each selected from the group consisting of Cu, Ag, Au, Zn, Al, W, Li and Mg; M is Ca, Sr, Na, K, Rb, O, F, Cl, Br or I; $0.001 < e < 0.999$; $0.001 < g < 0.999$; $0 \leq m \leq 2$; and $0 < z < 2$ (1+m), as an active material of a negative electrode, in an amount of 75% to 99.9% by weight [or more] of the composition of the negative electrode.

21. (Amended) A nonaqueous secondary battery, which comprises:

a negative electrode whose active material comprises a compound of formula (1):

A_aS (1)

wherein A is Cu, Ag or Au, and $0.4 \leq a \leq 5$, in an amount of 75% to 99.9% by weight [or more] of the composition of the negative electrode, and a nonaqueous electrolytic solution as an electrolyte.--